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Posted at the Zurich Open Repository and Archive, University of Zurich
ZORA URL: https://doi.org/10.5167/uzh-85874
Conference or Workshop Item
Published Version

Originally published at:
Finger, David; Petursdottir, Thorunn (2013). Preserving and maintaining vital ecosystem services: the importance of linking knowledge from geosciences and social-ecological system analysis. In: European Geosciences Union General Assembly 2013, Wien (A), 7 April 2013 - 12 April 2013. Copernicus Meetings, online.

Geophysical Research Abstracts
Vol. 15, EGU2013-8075, 2013
EGU General Assembly 2013
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Preserving and maintaining vital Ecosystem Services: the importance of linking knowledge from Geosciences and social-ecological System analysis

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Human kind has always been curios and motivated to understand and quantify environmental processes in order to predict and anticipate the evolution of vital ecosystem services. Even the very first civilizations used empirical correlations to predict outcomes of rains and subsequent harvest efficiencies. Along with the insights into the functioning of ecosystems, humans also became aware that their anthropogenic activities can have positive and negative impact on ecosystem services. In recent years, geosciences have brought forward new sophisticated observations and modeling tools, with the aim to improve predictions of ecological developments. At the same time, the added value of linking ecological factors to the surrounding social structure has received a growing acceptance among scientists. A social-ecological system approach brings in a holistic understanding of how these systems are inevitably interlinked and how their sustainability can be better maintained. We claim that the biggest challenge for geoscience in the coming decades will be to link these two disciplines in order to establish adequate strategies to preserve natural ecosystems and their services, parallel to their utilization.
We will present various case studies from more than a decade of research, ranging from water quality in mountain lakes, climate change impacts on water availability and declining fishing yields in freshwaters and discuss how the studies outcomes could be given added value by interpreting them via social-ecological system analysis. For instance, sophisticated field investigations revealed that deep water mixing in lake Issyk-Kul, Kirgizstan, is intensively distributing pollutants in the entire lake. Although fishery is an important sector in the region, the local awareness of the importance of water quality is low. In Switzerland, strict water protection laws led to ologotrophication of alpine lakes, reducing fishing yields. While local fishermen argued that local fishery is more ecological than importing fish, their calls for artificial lake fertilization were rejected and are socially not accepted. Finally, climate change projections of water availability in the Alps reveal that water may become scarce during summer months due to vanishing glaciers. Financially the hydropower sector is the most important water user. However, other stakeholders, like farmers and the tourism sectors will be all competing for the decreasing resources. In all these three cases, a social-ecological system analysis could give an added value to the geoscience results by identifying solutions that are both ecological and socially suitable. We will conclude our talk by giving an outlook how we intend to link the two disciplines to perform integrative assessments, linking geoscience to the relevant social-ecological system analysis in order to come up with strategies to sustainably preserve vital ecosystem services.